Endoscopic retrograde cholangiography via a permanent access loop

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ABSTRACT

Background/Aims: *The aim of this study was to investigate the indications, technical and clinical success, and complications of the endoscopic retrograde cholangiography (ERC) via a permanent access loop (PAL).*

Materials and Methods: *Twenty patients who underwent ERC through PAL between 2009 and 2017 were included in this study. The technical success was described as achieving access to the bile ducts through PAL and the clinical success was described as the clinical and laboratory improvement of the patients after the procedure.*

Results: *The study was performed with 20 patients. The median follow-up duration was 24 months (3-96) and the median number of ERC sessions was 3.9 (1-10). The most common ERC indications through PAL were stones (40%) and cholangitis (30%). In 16 patients (75%), anastomotic or branched strictures were observed. The improvement of strictures via intermittent stenting and dilatation was observed in 6 patients, but no improvement was observed in 5 patients. The treatment of those 5 patients continues. In this study, the technical success was 100% and clinical success was 85%. While no mortality due to PAL-mediated ERC was observed, free wall perforation was seen in one patient who was referred to surgery.*

Conclusion: *PAL-mediated ERC procedure is a technique with high technical and clinical success and low complication rate in patients who require frequent percutaneous procedures and those with difficult access to the biliary tract.*

Keywords: *Hepaticojejunostomy, cholangitis, endoscopic retrograde cholangiopancreatography*

INTRODUCTION

Biliary injury after cholecystectomy is seen in 0.3-0.7% of the patients (1). Biliary injury can also be seen after liver surgeries due to malignancy or benign causes, and in patients after the liver transplantation (2). In these patients, the hepaticojejunostomy (HJ) is the standard biliary bypass technique (3). However, 4%-11.9% of the patients have anastomotic strictures after HJ (4, 5). Recurrent stones, cholangitis, and biliary cirrhosis can be seen in untreated cases (6). Some of these strictures can be corrected by dilatation and intermittent stenting through percutaneous biliary access (7). The resistant conditions may require revision surgery (8, 9). Alternative treatment methods have been investigated because some cases are resistant to dilatation and stenting, and the revision surgery has a high morbidity and mortality rate. The endoscopic access to the bile ducts in these patients is difficult because of anatomic reasons (10).The subcutaneous hepaticojejunal access (permanent access) loop is an alternative way reaching to the skin and allowing direct access to the biliary tract (11, 12). In this technique, a loop of HJ is anastomosed to the anterior abdominal wall and endoscopic procedures can then be performed by this route (Figures 1, 2). This procedure allows the patients to get rid of frequent percutaneous interventions and allows the endoscopists easy access to the biliary tract using endoscopic retrograde cholangiography (ERC) (13). However, there are not many studies in the literature that have investigated the efficiency and safety of the permanent access loop (PAL)-mediated ERC procedure. The aim of this study was to investigate the indications, technical and clinical success, and complications of the PAL-mediated ERC procedure.

MATERIALS AND METHODS

This study was carried out by retrospectively examining the data of 9612 patients who underwent ERC between 2009 and 2017 in our hospital. Two groups of patients were in-

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cluded in the study: patients who underwent concomitant PAL and HJ surgeries and patients in whom the percutaneous transhepatic cholangiography (PTC) sessions were performed due to HJ stenosis but after the failure of the treatment, PAL surgery was performed. PAL surgery has been performed in the patients with resistant strictures and those who had tried a lot of endoscopic or percutaneous methods, such as double balloon enteroscopy-guided ERC, dilatation, and stenting with PTC. For PAL surgery, the length between the HJ and jejunojejunostomy was 50 cm. The closed proximal limb was passed through the anterior abdominal wall and was then fixed to the wall in a subcutaneous position. The data from 23 patients who underwent PAL surgery were examined and three patients were excluded due to the lack of data and follow-up.

The indications of HJ were found from the patient files and categorized into four main groups: 1) biliary injury due to cholecystectomy,2) biliary injury due to liver surgeries for the other benign etiologies,3) biliary injury due to the liver surgeries for malignant etiologies,and4)biliary injury after the liver transplantation.

The PAL-mediated ERC indications were classified into 4 groups:1) cholangitis, 2) biliary stone(s), 3) recurrent tumor, and4) cholestatic liver enzyme elevation due to strictures.

The anastomosis in the skin was opened surgically before the procedure and then closed again after the sessions were over. All the procedures were performed using a duodenoscope (Olympus TJF 260V Duodeno videoscope, Olympus, Tokyo, Japan), but a front-view endoscopy (Olympus GIF-H260 Video Gastroscope, Olympus, Tokyo, Japan) was used when necessary in difficult cases.

The ERC procedures were performed by three experienced endoscopists (SD, BÖ, and EP) under the midazolam and pethidine anesthesia. In contrast to the normal endoscopy procedure, the patients lie on their back during this procedure. A balloon occluded cholangiogram was obtained for the imaging of the bile ducts. The balloon dilatation was applied to the location of stenosis in the patients with anastomotic or branched strictures. In cases with biliary stones, the stones were retrieved by

MAIN POINTS

- *When access to the biliary tract is percutaneously or endoscopically difficult, permanent access loop surgery is a rare but effective method.*
- *Bile ducts can easily be accessed by the PAL-mediated ERC, thus, all the desired procedures can be done easily from this wide loop.*
- *Permanent access-mediated ERC procedure is a technique with high technical and clinical success and low complication rate in patients that require frequent percutaneous procedures and those with difficult access to the biliary tract.*

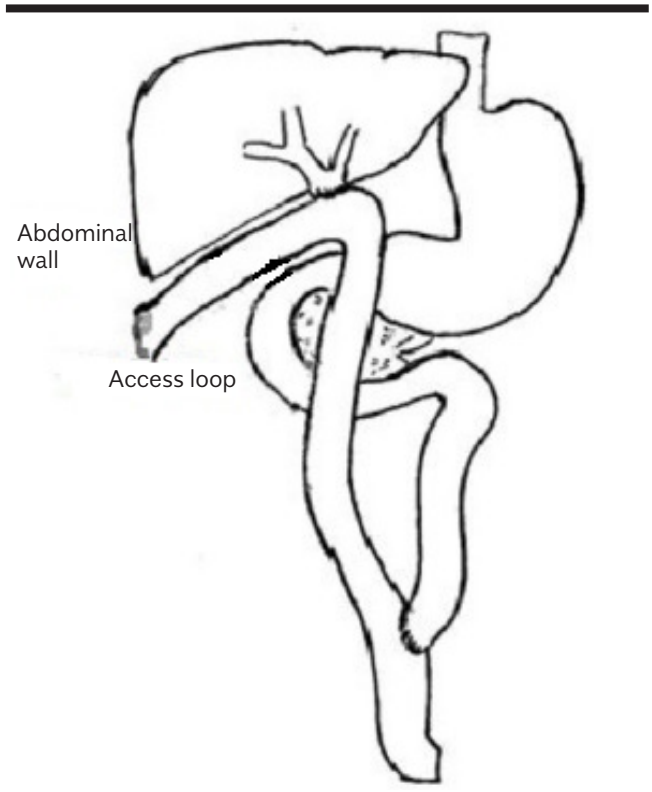

Figure 1. Schematic diagram of permanent access loop surgery.

Figure 2. ERC procedure via permanent access loop.

the balloon and mechanical lithotripsy was applied when necessary. When biliary drainage was necessary, the bilicutaneous drains (pigtail drains with the one side leading into the skin and the other in to the biliary tract) or plastic stents were used according to the patient's scopic and clinical conditions. In case of bilicutaneous drain placement, the outer end of the drain was contained inside a colostomy bag for the patient's comfort. The time passed after first ERC in our clinic or the time until the liver transplantation or mortality was considered as the follow-up period.

ERC session numbers and findings were recorded from the patients' files. Technical success was defined as the access to the bile ducts through PAL. Clinical success was defined as the improvement of the patient's clinical and laboratory findings after the procedures were performed. Complete improvement in the anastomotic or branch strictures was defined as radiological success. Procedure-related complications were recorded according to the existing ERC guidelines (14). During the follow-up, the national data bank was scanned for mortality. Mortality within 30 days after the procedure was considered as procedure-related complication.

Statistical analysis

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) for Windows 20 (IBM Corp.; Armonk, NY, USA). The normal distribution of the data was assessed by the Kolmogorov-Smirnov test. The normal distributions of the numerical variables are shown as mean ± standard deviation, and the non-normal distributions are shown as median (min-max). The categorical variables are provided as numbers and percentages.

This study was designed in accordance with the Brazil version of 2013 Helsinki Declaration and has been approved by the Research Ethics Committee with the decision date of March 29, 2018, and approval number 37. The written consent was not obtained because of the retrospective design of this study.

RESULTS

Ten women (50%) and 10 men (50%) were included in the study. The mean age of the patients was 51±10.1. The indications for HJ were the biliary injury due to cholecystectomy (65%), biliary injury due to the liver surgeries for the other benign etiologies (15%), biliary injury due to the liver surgeries for the malignant etiologies(15%), and biliary strictures after the liver transplantation (5%). Two patients (10%) underwent concomitant PAL surgery with HJ, while the remaining 18 patients (90%) underwent denovo surgery after HJ stenosis. The PAL-mediated ERC indications were stones (40%), cholangitis (30%), stricture-associated enzyme elevation (20%), and recurrent tumors (10%). The median follow-up time was 23.6 months (3-96). The median number of the ERC sessions was 3.9 (1-10). The findings of the patients are summarized in Table 1.

The ERC findings of the patients are given in Table 2. The balloon occluded cholangiogram was obtained in all patients. The anastomotic or branch strictures were seen in 16 patients (75%). The strictures were observed in branches in 12 patients (60%) and in anastomosis site in 8 patients (40%). In 4 patients, the strictures were observed both in the anastomosis site and branches. The strictures were totally fixed in six patients (30%) by intermittent stenting during the follow-up (radiologic success rate). The median time for the resolution of the strictures was 44 months (18-75) and the median ERC number was

Table 1. Demographic characteristics.

	N (%)
Number of patients	20
Age (years)	51±10.1
Gender, female/male	10 (50%)/10 (50%)
Indications of HJ	
Cholecystectomy	13/20 (65%)
Benign surgery	3/20 (15%)
Malignant surgery	3/20 (15%)
Liver transplantation	1/20 (5%)
Indications of ERC	
Stones	8 (40%)
Cholangitis	6 (30%)
Elevation in LFT	4 (20%)
Recurrent tumor	2 (10%)
Number of ERC sessions	3.9±1.7 (1-10)
Follow-up time (months)	23.6 (3-96)
Concomitant /denovo PAL surgery	2 (10%)/18 (90%)

ERC: Endoscopic retrograde cholangiography; HJ: Hepaticojejunostomy; LFT: Liver function tests; PAL: Permanent access loop

Table 2. The findings of endoscopic retrograde cholangiography.

	N (%)
Stricture	16 (80%)
Localization of stricture	
Branches	12 (75%)
Anastomosis	8 (50%)
Anastomosis+branches	4 (25%)
Are the strictures improved? (Yes/no/follow-up)	6 (30%)/5 (25%)/5 (25%)
Causes of non-improved strictures	
Recurrent tumor	2 (40%)
Resistant stricture	2 (40%)
PSC	1 (20%)
Stone in bile ducts	8 (40%)
Stone removal ratio	8/8 (100%)
Mechanical lithotripsy	3/8 (37.5%)

PSC: Primary sclerosing cholangitis; ERC: Endoscopic retrograde cholangiography

Table 3. Endpoints of the study

	N (%)
Technical success	20/20 (100%)
Clinical success	17/20 (85%)
Complications	1/20 (5%)
Cholangitis	0
Bleeding	0
Free wall perforation	1 (100%)
Procedure-related mortality	0
Total mortality	4/20 (20%)
Recurrent tumor	2 (50%)
Non-biliary causes	2 (50%)
Liver transplantation	1/20 (5%)

6 (4-9). In 5 patients (25%), there was no improvement in the strictures. When the findings of 5 patients with non-improved strictures were examined, it was seen that two patients had recurrence of the malignant tumor, two patients had resistant strictures at anastomosis sites and branches, and one patient had primary sclerosing cholangitis (PSC). These patients were referred to surgery. Although the clinical and laboratory findings of another 5 patients were improved, the ERC procedures are continuing due to the resistant strictures.

Biliary stones were found in 8 patients (40%). All the patients' stones were cleaned with intermittent ERC sessions during the follow-up. Three patients underwent mechanical lithotripsy for the removal of the stones.

The endpoints of the study are summarized in Table 3. In this study, the technical success was 100% and clinical success was 85%. A patient who did not achieve clinical success underwent liver transplantation due to the biliary cirrhosis. Clinical success was not achieved in two patients because of the recurrence of the malignant tumor. While there were no complications, such as cholangitis or bleeding due to the PAL-mediated ERC procedure in this study, free wall perforation was seen in one patient who was referred to surgery. Although no mortality related to the procedure was observed, mortality occurred in 4 patients during the follow-up. Two patients died due to recurrent tumors whereas two others died due to non-biliary causes.

DISCUSSION

Although PAL is a surgical procedure that has been applied for a long-time, there are not many studies about the indications, efficiency, and complications of the PAL-mediated ERC procedure in the literature. In this study, we demonstrate that bile ducts can easily be accessed by the PAL-mediated ERC procedure, and that the technical and clinical success rates of this procedure are high while the complications are low.

As it is well known, the most common indications for ERC are biliary stones and associated cholangitis (15). In our study, the most common indications of PAL-mediated ERC procedure were also the occurrence of stones and cholangitis. Intrahepatic stones and associated cholangitis are the major problems in patients who undergo the biliary bypass surgery. For this reason, percutaneous procedures are often needed in patients with HJ, and the alternative methods, such as PAL surgery are being tried in the resistant cases. However, the patients who have undergone PAL surgery get admitted to the hospital again with similar complaints, such as cholangitis and recurrent intrahepatic stones. In one study, it was seen that 22% of the patients who underwent PAL surgery due to recur-

rent intrahepatic stones were readmitted to the hospital with cholangitis due to residual stones in one year (12). The most important reason for these stones and associated cholangitis is the occurrence of the strictures. As a matter of fact, in our study, 16 cases showed the strictures in the anastomosis site or branches. The literature review suggests that intermittent stenting and dilatation success rates in the resistant strictures range from 50 to 70% in the patients who had biliary bypass surgery (16). In our study, only 6 patients (30%) showed complete improvement whereas 5 patients had no improvement. We believe that such an outcome occurred because of the additional comorbid conditions, such as PSC and the recurrence of malignant tumors in our non-improved patients. In addition, the improvement rate may be low because 5 patients are still continuing treatment at the course of the study.

Fan et al. (17) showed that the stone removal rate by ERC in patients with hepaticocutaneous jejunostomy was 93%. In our study, all the bile duct stones were cleaned. Our findings suggest that the PAL-mediated ERC procedure is an effective method for the removal of bile duct stones.

Kassem et al. (12) stated that patients have one to five ERC sessions after PAL surgery in one year. Parlak et al. (18) performed one to eight ERC sessions in their patients. The median number of ERC sessions in our study was found to be 3.9 (1-10). We needed more ERC sessions in our study because our follow-up period was longer, and we included not only patients with intrahepatic stones but also patients with PSC and recurrent malignancies. Since the follow-up period was longer, it allowed us to see that the long-term recurrent stenosis and associated intrahepatic stones are important clinical problems in patients with post-operative biliary strictures.

In our study, the technical success rate was 100% and the clinical success rate was 85%. Although there are not many studies in the literature about this therapeutic approach, the technical success was similarly found to be 100% in a study (12). Our study patients underwent HJ surgery, which made it almost impossible to apply endoscopic interventions except for the double balloon enteroscopy-assisted ERC; thus, accessing the biliary tract with 100% technical success indicates that this method is effective in gaining biliary access.

Clinical success was found to be 85% in our study. We believe that the reason for a relatively low success of our study is the recurrence of the malignant tumors in two patients and severely impaired anatomic structure due to PSC in one patient. As a matter of fact, Kassem et al. (12) did not achieve clinical success in 7 of 28 patients who underwent PAL surgery. The main reason for not achieving clinical success in this study is the occurrence of refractory biliary tract strictures. Although the percutaneous treatment of the biliary strictures is a successful method, the patients often are readmitted to the hospital with recurrent symptoms (19); the percutaneous methods are often ineffective in removing large stones. For this reason, the PAL-mediated ERC procedure appears to be an effective and alternative method for such patients.

In our study, the mortality related to the procedure was not seen but free wall perforation was seen in only one patient. Previously, Fan et al. (17) observed similar jejunal perforation case in a study with 41 patients. Even though these procedures are performed through a wide stoma opening, the perforation of the free wall in one patient still suggests that attention should be paid to such patients whose anatomic structural integrity is impaired. In our study, the complications were rarely seen because the common complications of ERC, such as pancreatitis and hemorrhage due to sphincterotomy were rarely seen due to anatomical structural changes. Although no mortality related to the procedure was seen in our study, the mortality caused by other reasons was seen in four patients during the follow-up. The recurrence of the malignant tumors in two of these four patients and the presence of additional non-biliary comorbid conditions in the two others were the main causes of mortality.

The most important limitation of the PAL-mediated ERC is the necessity for a surgical opening and closing before and after the procedure. However, the PAL-mediated ERC is a reasonable method when it is considered that PAL surgery is performed when the patients have frequent and long-standing PTC procedures. Also, none of our patients had a surgical complication during the PAL opening and closing procedure. It is an important advantage that PAL is easily accessible and reusable.

The most important limitation of our study is the retrospective design. Another important limitation is the low patient number since it is a rare surgical procedure.

In conclusion, the PAL-mediated ERC procedure is a technique with high technical and clinical success and low complication rate in patients that require frequent percutaneous procedures and those with difficult access to the biliary tract.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Ankara Yüksek İhtisas Training and Research Hospital, Date: 29.03.2018 and Number: 37.

Informed Consent: Since the study was designed retrospectively, no written informed consent was obtained from patients.

Peer-review: Externally peer-reviewed.

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